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*There has been increasing public concern about whether financial aid programs enable low-income youth to pursue college education. This study identifies overall changes in college-going behavior before and after the Basic Educational Opportunity Grant program. It finds that federal efforts to increase college access have been constrained by a heavy reliance on test scores in college admissions decisions. The analysis is based on college-going decisions of the 12,099 high school graduates who participated in the 1982 High School and Beyond Survey.*

Americans consider higher education an important instrument for ensuring equality of opportunity. It is a prerequisite for many careers, and a major determinant of high income, independence, and prestige. Higher education also affects the vitality of the economy, society, and culture. Therefore, it is fundamental to the continued growth and development of individuals and society.

Because of the importance and high promise of higher education, great efforts were made in the late 1960s and early 1970s to remove financial barriers to college attendance. Billions of federal and state dollars were invested in student financial aid programs. The objective of these programs was to eliminate financial barriers to higher education by awarding aid to students based on demonstrated financial need.

The present study builds on a study of 1972 high school graduates by Manski and Wise (1983). It focuses on the interplay between economic factors affecting college application, such as family income or student financial aid, and academic achievement. The objective is to examine the extent to which financial barriers have been removed for college participation of low-income youth. This is done by comparing the impact of family income on the decisions of 1972 and 1982 high school graduates to enroll in college. The study also demonstrates how inadequate academic preparation has constrained efforts to increase college access for American youth.

## Research on College-Going Behavior

The low rate of college attendance by economically-disadvantaged youth has evoked great interest among social scientists who study the forces affecting access to college. Existing research takes three conceptual approaches.

### *Individual Attributes Approach*

According to this approach, a student's future success depends on his or her past success. Researchers using the individual attributes approach have focused on the impact of high school achievement and test scores and the impact of participation in curricular and non-curricular activities on the probability of

enrolling in college (American Council on Education, 1949; Berdie, 1954; Bishop, 1977; Carpenter and Fleishman, 1987; Christensen et al., 1975; Domain, 1967; Hause, 1969; Jackson, 1978; Manski and Wise, 1983; Otto, 1975; Peters, 1977; Rumberger, 1982; Schafer and Armer, 1968; Spady, 1970; Tillery, 1973; Tuttle, 1981; Yang, 1981). These studies have reported that high test scores, high academic achievement, and participation in extracurricular activities increase the college enrollment probabilities of recent high school graduates.

*Sociological Approach*

*"The low rate of college attendance by economically-disadvantaged youth has evoked great interest among social scientists who study the forces affecting access to college."*

This approach emphasizes the importance of social class on attendance. Researchers using this approach have focused on the effect of socioeconomic status on college enrollment (Alexander et al., 1978; Bordua, 1960; Clotfelter et al., 1991; Corazzini et al., 1972; Duncan et al., 1972; Elsworth et al., 1982; Falsey and Heyns, 1984; Gilmour et al., 1978; Hause, 1969; Hearn, 1988; Jackson, 1978; Otto, 1976; Perlman, 1973; Rumberger, 1982; Sewell and Hauser, 1972; Sewell et al., 1969; Sewell et al., 1970; Sewell and Hauser, 1975; Sewell and Shah, 1978; Thomas et al., 1979; Tuttle, 1981; Yang, 1981).

Generally, investigators have found that enrollment rises with socioeconomic status. Clotfelter et al. (1991) noted that high school graduates in the top quartile of socioeconomic status were more than twice as likely to enroll in four-year colleges compared with those in the lowest quartile. Family income also has received considerable attention (Berdie, 1954; Bishop 1977; Bruno 1976; Mortenson and Wu, 1990).

Earlier studies reported on the importance of family income despite ability level. Bishop (1977), analyzing 1960 data, reported that high family income increased the probability of entering college for all ability levels, particularly for low-ability levels. However, later studies have reported a decreased effect of family income. Besides documenting the influence of socioeconomic status and family income, researchers have examined the effects of parental education on college-going behavior (Carpenter and Fleishman, 1987; Gilmour et al., 1978; Hossler and Stage, 1987, 1992; Manski and Wise 1983; Tuttle, 1981; Yang, 1981), and whether the family resides in an urban, suburban, or rural area (Berdie, 1954; Burchinal, 1961; Dahl, 1982; Lam and Hoffman, 1979; Middleton and Grigg, 1959; Nelson, 1973; Sewell, 1964). These studies report that both parental education and urban residence increase the probability of college enrollment.

*Economic Approach*

This approach holds that decisions about entry to higher education are influenced by perceptions of investment yields from a college education. The basic proposition is that demand for higher education increases as the private rate of return rises relative to the return from investing in other opportunities (Hayden and Carpenter, 1990; Manski and Wise, 1983). Hayden and Carpenter (1990) have observed that in Australia, high school graduates have responded to both

a deterioration in the income advantage of having a college degree and the increasing cost of obtaining a degree. However, in the United States, Manski and Wise (1983) have estimated only small effects of local market conditions on college attendance.

The impact of student financial aid also has received extensive attention in the last two decades (Breneman, 1982; Cabrera, Stampen, and Hansen, 1990; Clotfelter et al., 1991; Hansen, 1982; Manski and Wise, 1983; Mortenson and Wu, 1990). The general conclusion is that financial aid has little impact on college enrollment of targeted groups, mainly because of a high degree of overlap between being poor and being ill-prepared for college.

## The Present Study

This study draws on all three conceptual approaches, examining the effects of individual and family background and of economic factors on the college-going behavior of high school graduates. Estimation techniques are similar to those used by the Manski and Wise (1983) study of 1972 high school graduates. In their analysis, Manski and Wise reasoned that college admission decisions depend on the college's academic standards and on the socioeconomic background and characteristics of applicants. They included individual attributes such as test scores, high school achievement, participation in extracurricular activities, family income, parents' education, and race. They also included two local market indicators: local wages and unemployment rate. In addition, they hypothesized that an individual's decision to attend college depends on the quality of available schools.

By adapting the Manski and Wise approach, this study identifies overall changes between 1972 (before the introduction of the Basic Educational Opportunity Grant program) and 1982 after more than $110 billion had been spent on improving access to college.[1] Particular attention is given to assessing the net effects of investment in student aid and of institutional efforts to promote access. After noting the overall changes, this study focuses on the effect of family income and test scores on college attendance decisions.

## Model

The model estimates the effect of students' individual ability and socioeconomic background on college application. It is presumed that whether people find it worthwhile to go to college or not depends on the available opportunities to them without a college degree and the cost of a college education. Manski and Wise (1983) described this standard economic reasoning as follows:

> [T]he opportunities available to individuals without college, the relationship between college and subsequent opportunities, and the college cost incurred by individuals are likely to depend on personal attributes. For example, people with high academic aptitude may gain more from college than people with lower aptitude. The cost of college to students–relative to the gains–is likely to depend on the wealth of their parents. The socioeconomic background of individuals may in general influence their schooling decisions; and opportunities without a college degree will be determined in part by the local labor market conditions in the regions where these individuals live. Finally, it is also reasonable to suppose that whether an individual chooses to go to any particular

college depends on the quality of schools he or she would attend. It is also presumed that college admission decisions depend on the college's academic standards and on the individual attributes of the applicant being considered. (Manski and Wise, 1983, p.70)

The model presumes that a person's college application probability and college choice depend on the individual's ability, family background, and a random term. Similarly, admission probability depends on the individual's ability, the quality of college, and a random term. These relationships can be expressed as follows:

**Application:** $A_i = X_{1i}\,\beta_1 + \varepsilon 1i$
**College Quality:** $Q_i\, X_{2i}\, \beta_2 + \varepsilon 2i$
**Admission:** $E_i = X_{3i}\, \beta_3 - Q_i + \varepsilon 3i$

The likelihood that an individual *i* applies to a college is assumed to be represented by an unobserved variable $A_i$ that depends on personal characteristics $X_{1i}$ and the random term $\varepsilon 1i$. The quality of school that a person applies is given by the continuous variable $Q_i$, also assumed to depend on personal characteristics $X_{2i}$ and a random term $\varepsilon 2i$. It should be interpreted as the quality of college a person with measured attributes X would select as a first choice of where to apply to college.

The likelihood that a person with characteristics $X_{3i}$ will be admitted to a school of quality $Q_i$ is indicated by the unobserved variable $E_i$ that depends on the random term $\varepsilon 3i$ and $X3i$.[2] Not all elements of the X are entered in each equation. Personal attributes and race are entered in all three equations, but family background is entered in the application and college quality equations (but not the admission equation). Economic background is entered only in the application equation. Finally, it is helpful to keep in mind that the random terms capture unmeasured determinants of these relationships.

Since admission probability has to be based on the students who applied to college, the model integrates the application with admission decisions and college quality. A sample selection model has been employed in the admission equation: i.e., admission estimates are based on those students who actually applied to a college.[3] The outcome of the model can be expressed as follows:[4]

**Application/** X
**College Quality/** Application
**Admission/** Application

## Data

This study employed data from the High School and Beyond (HSB) data of 1982. The data is old; however, it is the most comprehensive data to make comparison with a Manski and Wise study that used the National Longitudinal Study (NLS) data of 1972. Because HSB has a data coverage similar to NLS, HSB data will enable us to pinpoint the changes in college-going behavior of youth after a decade following implementation of the Basic Educational Opportunity Grant program. Furthermore, the present study is the only study to replicate Manski and Wise (1983) findings by applying a similar model of college-going behavior.

The survey design provided for a highly-stratified national probability sample of more than 1,100 secondary schools as the first unit of selection. This

study uses the sophomore cohort of the HSB survey, which is a sample of the 12,099 high school students who graduated in 1982. The data set includes school, family, work experiences, educational and occupational aspirations, personal values, and test scores.

The analysis is based on applications to four-year colleges and universities; those students who had applied to two-year schools or vocational institutions were not included. The application and admission analysis is based on the first choice for application and on admission to the first choice of college.

## Dependent and Independent Variables

*Dependent Variables*

Application decisions, the *quality of college* under consideration and *admission decisions* are the three dependent variables. *Application* is the students' application to four-year colleges. *Admission* in this study means admission to a four-year college or university. *College quality* is measured by the average SAT scores of entering students at the college to which an individual has applied.[5] The High School and Beyond Survey includes two variables: one shows applications to four-year colleges;[6] another indicates admission to the applicants' first choice of college.

*Independent Variables*

The analysis focuses on three sets of independent variables. The first set describes the individual attributes of students: high school performance, academic ability, and participation in high school athletics and student council. These individual attributes are presumed to influence student application and admission decisions.

The second set measures characteristics of the students' social environment and enters the application equation only. This set includes family income, the separate educational attainment levels of mothers and fathers, and the locations of high schools the students attended. Race is also thought to affect application; it is included in this set and allowed to interact with geographical regions, such as, South versus non-South.

Characteristics of the local economy make up the third set of variables in the analysis, including: the local wage rate and the local unemployment rate. These enter in the application equation. A gender variable is also included in the analysis.

Appendix 3 shows the means and standard deviations for all the variables included in this study.

The variables are:

- **SAT Score:** combined (verbal plus math) Scholastic Aptitude Test (SAT) score of the student.[7]
- **College quality:** the average of the SAT scores of the students entering the college to which an individual has applied.[8]
- **High school class rank:** the percentile rank of a person in his or her high school, based on course grades; obtained from high school transcript files.
- **High school leader:** a value of one is assigned if the student was a leader in high school student council; zero, otherwise.
- **High school athlete:** a value of one is assigned if the student participated

as a leader in high school athletics; zero, otherwise.

- **Education of mother (father) less than high school:** a value of one is assigned if the student's mother (father) had less than high school education; zero, otherwise.
- **Education of mother (father) college degree or more:** a value of one is assigned if the student's mother (father) had a college degree or more; zero otherwise. The category of "some years after high school, but less than college degree" is omitted.
- **Family income:** as reported by students.[9]
- **Black in the South:** a value of one is assigned for black students who went to high school in the South[10] (college application and college quality equation), or applied to a college in the South (admission equation).
- **Black in the non-South:** this category has been defined analogously to "Black in the South."
- **White in the South:** this category has been defined analogously "Black in the South." The category of "white in the non-South" has been omitted.
- **Local wage rate:** 1980 wages of manufacturing workers in the standard metropolitan statistical area (SMSA) of the student's high school.
- Local unemployment rate: 1980 SMSA unemployment rates.
- **Urban:** a value of one is assigned if the respondent went to high school in an urban or suburban area; zero, if the respondent went to high school in a rural area.
- **Male:** a value of one is assigned if the respondent is male; zero, if female.

## Results

A comparison of the present findings with those of Manski and Wise (1983) shows that overall college-going behavior between 1972 and 1982 did not change. In both studies, about 35% of the high school graduates applied to a four-year college. Another quarter of them applied to two-year community colleges. About 90% of the students who applied to four-year colleges were admitted to their first choice of college. Academic preparation continues to govern the college application decisions of youth. The effect of family income on college application decisions, however, diminished from 1972 to 1982. Also in 1982, more female high school graduates applied to colleges than in 1972.

## College-Going Behavior of Youth

The parameter estimates and standard errors (Appendixes 1A and 1B) from the two studies suggest that academic preparation and high school achievement continue to determine the college application decisions and college choice of youth. Table 1 follows the Manski and Wise presentation by showing the effects of two standard deviations and category changes in selected variables on the probability of college application, college quality, and probability of admission. As shown, SAT scores and high school achievement are the two most important determinants of college application decisions. Similarly, the quality of college remains the only significant factor in admission decisions. Parents' education and, to a lesser extent, participation in varsity sports also show up as important factors in both application and college quality.

With SAT scores and other variables held constant, students whose parents are highly educated and students who participated in sports are much more

likely to apply to a college than those whose parents are less well educated and those who did not participate in high school sports. Among those who applied for admission, students with high SAT scores, higher class rank, and whose parents are well educated apply to better quality colleges. On the other hand, college quality, defined as the average SAT score of students entering the college to which an individual applied, is the only notable factor in admission. More selective colleges are less likely to admit applicants.[11]

## Financial Aid and Educational Opportunity

Access to higher education ensuring equality of opportunity for American youth has been raised to the top of the political agenda several times in the past few decades. A perennial concern has been to increase the college participation of the less-advantaged. Federal and institutional efforts have attempted to assess what is needed to achieve equality of educational opportunity. Policy discussions have led to huge investments in financial aid programs to eliminate financial barriers to higher education. The more than $250 billion of federal, state, and institutional funds spent on financial aid programs between 1970 and 1990 have sparked intense discussions in both academia and the political arena about the merit of these programs.

A sound method of assessing the effects of student financial aid would be to compare educational opportunities before and after the initiation of financial aid programs.[12] This approach will help policy makers assess the outcomes of investments in student financial aid programs by documenting the changes in educational opportunities. The Manski and Wise (1983) findings are useful here, for they examined the college-going behavior of 1972 high school graduates, before there were major increases in funding financial aid programs and before the Basic Educational Opportunity Grants (BEOG) program was introduced. The present study examines the college-going behavior of high school graduates ten years after the beginning of the BEOG program. The changes in the college-application decisions of youth can be attributed to many reasons. Comparing the net effect of family income for 1972 and 1982 high school graduates, independent of other individual and social variables, does show improvement in removing financial barriers to college education.

To compare the estimated effects on the three outcomes (probability of application, college quality, and probability of admission) of changes in each of the independent variables, consider the effects of comparable changes in each of the independent variables. One standard deviation above versus one standard deviation below is a typical comparison. Thus, the difference between the groups is two standard deviations. The following discussions are based on these two comparisons, given in Appendixes 2A and 2B for the present study and the Manski and Wise study, respectively.

What is the influence of family income on college application decisions? Has the influence of family income on college application decisions been reduced since the introduction of major financial aid programs? Have efforts to remove financial barriers increased the educational opportunities for low-income youth in America? Current policy assumes that the ability to finance attendance plays a strong role in youths' decisions to pursue college education. By removing financial barriers, policy makers hope to increase college partici-

pation of low-income youth. Manski and Wise (1983) reported that the effect of parents' incomes on their children's application decisions was smaller than expected, but remained a significant factor in college attendance decisions. They found that in 1972 the college application probability of students whose parents' incomes were one standard deviation above the mean was .14 higher than the application probability of students whose parents' incomes were one standard deviation below the mean, other things being equal (Table 1).

Other things being equal" and "controlling for other variables" mean that except for the attribute under discussion, the other attributes are the same and equal to their average values in the sample. Similarly, "college" or "school" refers to four-year colleges or universities. Application to a college means application to a four-year college or university. In the sample, the mean SAT score is 800; one standard deviation is equal to 200. College SAT, on the other hand, has a mean value of about 950 and a standard deviation of about 150.

*"Academic preparation and high school achievement continue to determine the college application decisions and college choice of youth."*

Table 1 shows the effects of selected individual and family background characteristics on the probability of application, admission, and college choice for both studies,[13] based on the same procedures used by Manski and Wise (1983). The estimated effects of changes in each of the independent variables on the three outcomes–probability of application, college quality choice, and the probability of admission–are shown for both studies. In reporting the effects, a change of two standard deviations in each independent variable is estimated; all other variables are held at their means.

For example, the influence of SAT scores is based on the probability of application for a student with an SAT score one standard deviation above the mean and for a student with an SAT score of one standard deviation below the mean, other things being equal. The table entry of .40 is calculated by subtracting the college application probability of a student whose SAT score is one standard deviation below the mean from that of a student whose SAT score is one standard deviation above the mean. Therefore, the entry of .40 means that the probability a person with a SAT score one standard deviation above the mean to apply to a college is, on average, .40 higher than the second person with the same mean values for all other variables but whose SAT score is one standard deviation below the mean.[14] Similarly, a person with an SAT score two standard deviations higher than the score of a second person with the same mean values for all other variables will, on average, apply to a college with an average SAT score 183 points higher than the second person. This difference in SAT score would change the individual's probability of admission by .03, other things being equal. The corresponding values in the Manski and Wise study were .35, 120, and .12, respectively.

How influential is family income on youths' decisions to continue to college after the changes in major student financial aid programs in 1972? As seen in Table 1, results for 1982 show that the influence of family income on youths' application decisions was negligible. The college application probability of students whose parents' incomes are one standard deviation above the mean is only .04 higher than a student whose parents' incomes are one standard deviation below the mean, other things being equal. This decrease in the effect of family income might be due to the counteracting effect of student

## TABLE 1
## Comparison of College-Going Student Characteristics

The Effects of Two Standard Deviations and Category Changes in Selected Variables on Probability of College Application, College Quality, and Probability of Admission.

| | THE PRESENT STUDY | | |
|---|---|---|---|
| | **Probability of Application** | **College Quality** | **Probability of Admission** |
| SAT Scores | .40 | 183 | .03 |
| Class Rank | .14 | 46 | .03 |
| College Quality | | | -.08 |
| Parents' Income | .04 | 23 | |
| | **MANSKI AND WISE STUDY** | | |
| | **Probability of Application** | **College Quality** | **Probability of Admission** |
| SAT Scores | .35 | 120 | .12 |
| Class Rank | .29 | 81 | .13 |
| College Quality | | | -.15 |
| Parents' Income | .14 | 32 | |

financial aid. Manski and Wise (1983) similarly, attributed the small effect of family income to the counteracting effect of the newly-established financial aid programs.

Did the reduced effect of family income in 1982 mean an increase in the attendance of low-income youth at colleges? Because young people are not limited by their parents' incomes to finance college, one would expect many more low-income individuals pursuing college education. However, it would be premature to expect an increase in college opportunity merely because financial aid seems to offset the income gap between low- and high-income individuals. The influence of the foremost factor in both studies on college application decisions of youth–namely test scores–will be examined next.

### Test Scores Most Important to College Application Decisions

As mentioned earlier, the findings of the present study and the Manski and Wise (1983) study show that test scores are the most important determinant in young peoples' decisions to pursue higher education. Manski and Wise (1983) noted that the college application probability of students with SAT scores one standard deviation above the mean was .35 higher than for students whose SAT score was one standard deviation below the mean, other things being equal. Table 1 shows that the probability difference in 1982 was .40, suggesting that test scores remained as a strong factor in students' application decisions in 1982. In both years, SAT scores were the most important factor in college application decisions of youth. The probability that a person with the average attributes in the sample would apply to a college is .35.

The influence of test scores is not limited to application decisions; they also affect the college choice of individuals. Manski and Wise (1983) reported that there was a substantial amount of self-selection based on SAT scores in students' application decisions. Most individuals applied to schools where they were likely to be admitted. The present study also found that few students

applied to schools where the college SAT (= college quality), measured by the average SAT scores of entering students, was higher than their own SAT scores. By contrast, more than a quarter of the students with high SAT scores chose lower-quality colleges (where applicants' average SAT score is higher than the college SAT) as their first choice of application. A person with an SAT score of two standard deviations (about 400 points) higher than the score of a second person with the same mean values for other variables will, on average, apply to a school with an average college SAT score 183 points higher than the school to which the lower-scoring person applied. That difference was 120 points in the Manski and Wise (1983) study. In short, test scores continue to play a major role in college-going behavior of youth. SAT scores, in both studies, are one of the most important factors in the application decisions and college choices of individuals. The use of test scores in students' application decisions is notable: individuals apply only if they think they are most likely to be admitted to the college of their choice.

Besides test scores, prior achievement also had a strong effect on a youth's decision to pursue higher education. Manski and Wise (1983) reported that class rank was the second most important factor after test scores in youths' application decisions and college choices. This finding is also confirmed by the present study.

On the other hand, college admission decisions in both studies do not seem to be determined by any single factor. The quality of schools may be the only significant factor in admission decisions. High-quality colleges are less likely to admit applicants. College SAT is measured by the average SAT scores of students entering the college to which an individual had applied; the higher the college SAT score, the more difficult the entrance.

## Conclusions

Does the reduced effect of family income observed in 1982 mean an increased college attendance rate for low-income youth? This is not necessarily true. The effect of low family income on college application decisions was based on the assumption that all individuals have the same mean values for other variables, including SAT scores. However, it is well known that the college applicant pool largely consists of students with SAT scores at the mean or above (Clotfelter et al., 1991). The estimates for this study showed that just over one-quarter of the low-income youth had SAT scores at or above the average SAT scores, whereas almost three-quarters of the students from more affluent backgrounds had SAT scores at or above the mean. (See Table 2.) Although more low-income students apply to college compared with high-income individuals of comparable SAT scores,[15] this is not enough to overcome weak representation of low-income youth in colleges. Because the number of low-income youth who have high SAT scores is comparatively small (28%), studies aimed at assessing the effect of student financial aid on the participation rates of low-income youth are likely to report disappointing results.

Between 1972 and 1982, academic preparation, as represented by test scores, remained the most important factor in youths' decisions to apply to colleges. Though student aid did offset the lack of resources among low-income youth, the findings showed that in both 1972 and 1982 poor academic

**TABLE 2**
**Family Income by SAT Scores (in percentages)**

| Family Income | SAT Scores | |
|---|---|---|
| | Below Average | Above Average |
| Lowest Income Bracket | 72% | 28% |
| Highest Income Bracket | 27 | 73 |

Lowest income bracket for 1982 high school graduates was $7,999 or less. Highest income bracket was $50,000 or more.

preparation prevented many of them from applying to college.

The small effect of family income on college application decisions implies improvements in ability to finance college education; however, when the effect of test scores is controlled, this improvement did not alter the college-going behavior of youth. Even in 1972 before the major need-based grant program, BEOG (more recently renamed Federal Pell Grant Program) was introduced, Manski and Wise (1983) reported a small effect for family income on youths' college application decisions. The small effect showed that both family income and student financial aid were not paramount in affecting youths' decisions to pursue higher education, if they were not well prepared academically.

Because the application decisions were determined largely by the test scores of individuals, the finding that financial aid had little impact on college application rates must be interpreted with care. For example, Manski and Wise (1983), by simulating the enrollment patterns of 1979 by income group with and without financial aid, reported that the BEOG had "virtually no effect" on enrollment at four-year colleges. The findings of the present study also suggested that financial aid programs had little influence on applications to four-year colleges. However, the estimates assembled here reflected the relatively small number of need-based aid recipients who also had high SAT scores among those who applied to four-year colleges. Therefore, financial aid programs like BEOG appear to have had a minimal effect on college application.

Lastly, the screening role of test scores is worth mentioning. As reported earlier, test scores largely determined the college application decisions of youth. This means economically-disadvantaged youth have to be prepared for college long before they reach college age.

## Recommendations

Studies assessing the impact of student financial aid seem to be divided into two groups: those indicating student aid accomplished its goals, and others that conclude investing in student financial aid is ineffective. Findings of the present study suggest that both sides have some merit in their arguments. Those who believe that financial aid worked for the poor are right because financial aid gave an opportunity to those who had high scores on aptitude tests and achieved high academic records in high school level.

Those who reported that financial aid has not worked for the poor are also right, because the proportion of poor students at four-year colleges has not

[11]For a detailed discussion of other individual and socioeconomic factors, see Özden, 1993.

[12]Even though the history of financial aid goes back to early 17th century, heavy investment in need-based programs did not begin until the early 1970s.

[13]Full tables are shown in Appendixes 2A and 2B.

[14]The probability of application for a student with a 1000 SAT scores is .70. The probability for a student with a 600 SAT scores is .30. The table entry of .40 is the first probability minus the second.

[15]While 70% of the high-income students have SAT scores at or above the mean, only 55% of them applied to college. On the other hand, almost all of the low-income students with SAT score at or above the mean applied to college. When income is divided into eight brackets, about a quarter of the lowest-income bracket had mean or above SAT scores. The college application rate for individuals in the lowest-income bracket was 27%.

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## APPENDIX 1A
## Parameter Estimates and (Standard Errors) by Equation

| Variable | Probability of Application | College Quality | Probability of Admission |
|---|---|---|---|
| SAT score (÷ 1000) | 2.456 | 0.471 | 1.167 |
| | (0.077) | (0.039) | (0.318) |
| High School rank (÷ 100) | 0.171 | 0.024 | 0.151 |
| | 0.013) | (0.003) | (0.032) |
| High school leader | 0.302 | 0.045 | 0.165 |
| | (0.050) | (0.008) | (0.096) |
| High school athlete | 0.315 | 0.033 | 0.081 |
| | (0.034) | (0.007) | (0.073) |
| College SAT (÷ 1000) | | | -3.946 |
| | | | (0.209) |
| Parents' income (÷ 1000) | 0.009 | 0.002 | |
| | (0.003) | (0.000) | |
| Parents' income missing | -0.405 | 0.034 | |
| | (0.034) | (0.009) | |
| Mothers' education | | | |
| Less than high school | -0.141 | -0.005 | |
| | (0.040) | (0.007) | |
| College degree or more | 0.228 | 0.035 | |
| | (0.033) | (0.006) | |
| Fathers' education | | | |
| Less than high school | -0.038 | -0.014 | |
| | (0.038) | (0.007) | |
| College degree or more | 0.279 | 0.039 | |
| | (0.034) | (0.007) | |
| Black in the South | 0.523 | 0.004 | -0.023 |
| | (0.056) | (0.012) | (0.148) |
| White in the South | 0.068 | -0.036 | -0.181 |
| | (0.040) | (0.006) | (0.098) |
| Black in the non-South | 0.464 | 0.063 | 0.061 |
| | (0.051) | (0.011) | (0.104) |
| Local wage rate | 0.010 | | |
| | (0.010) | | |
| Local unemployment rate | -0.009 | | |
| | (0.006) | | |
| Male | -0.176 | -0.014 | -0.117 |
| | (0.028) | (0.005) | (0.061) |
| Urban high school | 0.168 | 0.037 | -0.224 |
| | (0.032) | (0.006) | (0.079) |
| Constant | -2.288 | 0.344 | 4.597 |
| | (0.109) | (0.056) | (0.359) |

Log-likelihood value = -7,278.812. Total sample = 12,099. Number of four-year college applicants = 4,462. Number admitted = 3,996.

Note: The SAT = College Entrance Examination Board scores. College SAT = The average SAT scores of entering students at the college to which an entering student has applied. There should be an inverse relationship between the two scores.

## APPENDIX 1B
## Parameter Estimates and (Standard Errors) by Equation (Manski and Wise Study)

| Variable | Probability of Application | College Quality | Probability of Admission |
|---|---|---|---|
| SAT score (÷ 1000) | 2.423 | 0.303 | 1.471 |
| | (0.150) | (0.018) | (0.636) |
| High school rank (÷ 100) | 1.431 | 0.147 | 1.155 |
| | (0.100) | (0.013) | (0.269) |
| High school leader | 0.337 | 0.028 | 0.241 |
| | (0.077) | (0.009) | (0.173) |
| High school athlete | 0.333 | 0.038 | 0.082 |
| | (0.066) | (0.008) | (0.130) |
| College SAT (÷ 1000) | | | -3.525 |
| | | | (1.957) |
| Parents' income (÷ 1000) | 0.266 | 0.023 | |
| | (0.047) | (0.006) | |
| Parents' income missing | 0.254 | 0.026 | |
| | (0.075) | (0.010) | |
| Mothers' education | | | |
| Less than high school | -0.041 | -0.009 | |
| | (0.054) | (0.007) | |
| College degree or more | 0.226 | 0.010 | |
| | (0.070) | (0.008) | |
| Fathers' education | | | |
| Less than high school | -0.248 | -0.027 | |
| | (0.053) | (0.007) | |
| College degree or more | 0.238 | 0.031 | |
| | (0.061) | (0.007) | |
| Black in the South | 1.243 | -0.106 | -0.055 |
| | (0.088) | (0.009) | (0.336) |
| White in the South | 0.034 | -0.025 | -0.143 |
| | (0.056) | (0.007) | (0.115) |
| Black in the non-South | 1.242 | 0.058 | 0.174 |
| | (0.105) | (0.012) | (0.200) |
| Local wage rate | -0.078 | | |
| | (0.032) | | |
| Local unemployment rate | -0.013 | | |
| | (0.010) | | |
| Male | 0.168 | 0.021 | -0.095 |
| | (0.044) | (0.006) | (0.095) |
| Urban high school | 0.002 | 0.009 | 0.049 |
| | (0.047) | (0.006) | (0.097) |
| Constant | -3.738 | 0.457 | 1.513 |
| | (0.192) | (0.021) | (0.633) |

Log-likelihood value = -1,095.9. Total sample = 5,001. Number of four-year college applicants = 2,005. Number admitted = 1,799.

Note: The SAT = College Entrance Examination Board scores. College SAT = The average SAT scores of entering students at the college to which an entering student has applied. There should be an inverse relationship between the two scores.

## APPENDIX 2A
## Effects of Standard Deviations and Category Changes in Variables by Equation

| Variable | Probability of Application | College Quality | Probability of Admission |
|---|---|---|---|
| SAT score, 1 s.d. above the mean versus 1 s.d. below the mean | .40 | 183 | .03 |
| H.S. class rank, 1 s.d. above the mean versus 1 s.d. below the mean | .14 | 46 | .03 |
| H. S. student leader versus not | .06 | 29 | .01 |
| High school athlete versus not | .10 | 28 | .01 |
| College SAT, 1 s.d. above the mean versus 1 s.d. below the mean | | | -.08 |
| Parents' income, 1 s.d. above the mean versus 1 s.d. below the mean | .04 | 23 | |
| Education of mother and father; college degree or more versus education of mother and father high school or less | .20 | 72 | |
| Black in the South versus White in the non-South | .10 | 02 | .00 |
| White in the South versus White in the non-South | .02 | -25 | -.01 |
| Black in the non-South versus White in the non-South. | .10 | 35 | .01 |
| Local wage rate, 1 s.d. above the mean versus 1 s.d. below the mean | .02 | | |
| Local unemployment rate, 1 s.d. above-the mean versus 1 s.d. below the mean | -.02 | | |
| Male versus female | -.06 | -14 | -.01 |
| Urban high school versus rural high schools | .06 | 31 | -.01 |

Total sample = 12,099. Number of four-year college applicants = 4,462. Number admitted = 3,996. s.d. = Standard Deviation.

Note: The SAT = College Entrance Examination Board scores. College SAT = The average SAT scores of entering students at the college to which an entering student has applied. There should be an inverse relationship between the two scores.

## APPENDIX 2B
## Effects of Standard Deviations and Category Changes in Variables by Equation (Manski and Wise Study)

| Variable | Probability of Application | College Quality | Probability of Admission |
|---|---|---|---|
| SAT score, 1 s.d. above the mean versus 1 s.d. below the mean | .35 | 120 | .12 |
| H.S. class rank, 1 s.d. above the mean versus 1 s.d. below the mean | .29 | 81 | .13 |
| H. S. student leader versus not | .13 | 28 | .04 |
| High school athlete versus not | .13 | 41 | .02 |
| % of high school class going to college, 1 s.d. above the mean versus 1 s.d. below the mean | .12 | 40 | -.03 |
| College SAT, 1 s.d. above the mean versus 1 s.d. below the mean | | | -.15 |
| Parents' income, 1 s.d. above the mean versus 1 s.d. below the mean | .14 | 32 | |
| Education of mother and father; college degree or more versus education of mother and father high school or less | .29 | 78 | |
| Black in the South versus White in the non-South | .46 | -106 | .01 |
| White in the South versus White in the non-South | .01 | -25 | -.01 |
| Black in the non-South versus White in the non-South | .45 | 58 | .03 |
| Local wage rate, 1 s.d. above the mean versus 1 s.d. below the mean | -.03 | | |
| Local unemployment rate, 1 s.d. above the mean versus 1 s.d. below the mean | -.02 | | |
| Male versus female | .06 | 21 | .02 |

Total sample = 5,001. Number of four-year college applicants = 2,005. Number admitted = 1,799. s.d. = Standard Deviation.

Note: The SAT = College Entrance Emamination Board scores. College SAT = The average SAT scores of entering students at the college to which an entering student has applied.There should be an inverse relationship between the two scores.

## APPENDIX 3
## Variable Means and Standard Deviations for Total Sample And College Applicants

| Variable | Total Sample | | Applicants Only | |
|---|---|---|---|---|
| | Mean | Standard Deviation | Mean | Standard Deviation |
| SAT score | 754 | 211 | 879 | 94 |
| H. S. class rank | 1.387 | 1.105 | 1.038 | 0.957 |
| H. S. student leader | 0.638 | 0.244 | 0.115 | 0.319 |
| High school athlete | 0.162 | 0.368 | 0.239 | 0.426 |
| College SAT | | | 941 | 132 |
| Parents' income | 11.97 | 5.38 | | |
| Mother's education: | | | | |
| Less than high school | 0.202 | 0.401 | 0.114 | 0.318 |
| College degree or more | 0.254 | 0.435 | 0.398 | 0.489 |
| Fathers' education | | | | |
| Less than high school | 0.223 | 0.416 | 0.136 | 0.343 |
| College degree or more | 0.295 | 0.456 | 0.465 | 0.499 |
| Black in the South (H.S.) | 0.060 | 0.237 | 0.060 | 0.237 |
| White in the South (H.S.) | 0.147 | 0.354 | 0.149 | 0.356 |
| Black in the non-South (H.S.) | 0.074 | 0.261 | 0.083 | 0.276 |
| Black in the South (Coll.) | 0.046 | 0.209 | | |
| White in the South (Coll.) | 0.088 | 0.284 | | |
| Black in the non-South (Coll.) | 0.097 | 0.296 | | |
| Local wage rate | 7.897 | 1.520 | | |
| Local unemployment rate | 9.622 | 2.641 | | |
| Male | 0.493 | 0.500 | 0.468 | 0.500 |
| Urban high school | 0.739 | 0.439 | 0.778 | 0.416 |

Total sample = 12,099. Number of four-year college applicants = 4,462.
Number admitted = 3,996.

Note: The SAT = College Entrance Examination Board scores. College SAT = The average SAT scores of entering students at the college to which an entering student has applied. There should be an inverse relationship between the two scores.